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Pregnancy outcomes of COVID-19 infection in Iraqi women presented to primary health care center

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ABSTRACT

Background: COVID-19 pandemic disease had great impact on health status in Iraq. The pregnant women and their infants might be at higher risk after infection by COVID-19 disease.

Aim of study: To evaluate the maternal and neonatal characteristics of pregnant women infected by COVID-19 disease and assessing the maternal and neonatal outcomes in Iraqi from a sample of pregnant women.

Patients & Methods: A clinical prospective follow up study carried out in Obstetrics care unit of Al-Jamiaa health care center of Al-Adil Health sector of Al-Karkh Health Directorate in Baghdad city-Iraq. The duration of the study was six months through the period from 1st of July to end of December, 2020. A convenient sample of 132 pregnant women at labour was selected after eligibility to inclusion and exclusion criteria. The pregnant women enrolled in the study were tested by COVID-19-Reverse transcription *polymerase chain reaction* test at their admission to hospital. The diagnosis was done by clinical and laboratory investigations including neutophilia and lymphopenia, very high CRP, elevated D-dimer and sometimes on extent of lung involvement by x-ray.

Results: The present study showed that 63.6% of pregnant women at labour room had positive COVID-19 infection, while only 6 (4.5%) fetuses had positive COVID-19 infection after delivery. There was a highly significant association between first cesarean section of pregnant women and positive COVID-19 infection ($p<0.001$). A significant association was observed between preterm labour of fetuses and positive maternal COVID-19 infection ($p=0.01$). There was a significant association between meconium aspiration of fetuses and positive maternal COVID-19 infection ($p=0.001$).

Conclusions: The incidence of maternal and fetal COVID-19 infection among sample of Iraqi pregnant women presented to primary health care center for antenatal care is high.

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Introduction:

Since declaration of coronavirus disease 19 (COVID-19) as pandemic by World Health Organization (WHO), great worry was directed toward pregnant women and their fetuses [1]. The COVID-19 infection caused severe acute respiratory syndrome clinically presented by fever, cough and fatigue [2] and radiologically presented with ground glass opacities [3] and may be accompanied by 3-15% mortality rates [4]. The first reported pregnant women infected by COVID-19 was in China at 2019,[5] that followed by many cases developed severe form of the disease [6] and confirmed later the risk of maternal-fetal vertical transmission of severe COVID-19 infection [7]. The pregnant women might be at higher risk to be infected by COVID-19 diseases due to physiological changes of pregnancy like changes in immunological, respiratory and vascular systems, that lead to variable response to the disease 2 and also the infants might be at higher risk through their development [8].

The physiological changes in immune system of pregnant women like shifting in CD+T cells, lowering levels of natural killer cells, higher progesterone levels and changes in innate immune system lead to alteration of response of pregnant women to COVID-19 infection [9]. The anatomical and physiological pregnancy changes of respiratory system such as diaphragm changes lead to reducing of lung volume and lowering the functional residual capacity that aggravating the COVID-19 disease [10]. Hypercoagulation, intravascular inflammation with increase of thrombin levels during pregnancy might make pregnant women at higher risk of thromboembolism and higher mortality if infected with COVID-19 disease [11-13]. Additionally, the changes in endothelial cells function during pregnancy also play role in altering response to viral infections [14]. Physiologically, the placenta acts as

barrier preventing transmission of maternal infections to fetuses,[15] however, it was shown that COVID-19 viruses was infecting the placenta leading to placental damage [16, 17]. The vertical transmission and placental infection is not always lead to fetal infection with COVID-19 virus [18-20]. For that, and also due to passage of maternal immunoglobulin through placenta, lower neonatal cases were reported [21]. Moreover, severe acute respiratory diseases of neonate are rare [22].

In poor countries, the maternal care system is already disrupted and the effect of pandemic infection crises might increase the maternal morbidity and mortality rates[23]. Many adverse maternal outcomes were reported throughout COVID-19 pandemic like lack of antenatal care, partner violence, anemia, miscarriage, in addition to death risk associated with COVID-19 infection [24, 25]. Recent data from United Kingdom reported higher risk of COVID-19 infection on pregnant women with higher susceptibility to poor outcomes [26]. Although minor adverse neonatal outcomes of COVID-19 disease were reported,[5, 27, 28] preterm birth risk was detected for pregnant women infected by COVID-19 disease [19]. Many authors documented that maternal infection by severe acute respiratory syndrome coronavirus (SARS) or Middle East respiratory syndrome (MERS) become severe and accompanied with many neonatal morbid condition like prematurity, miscarriage and fetal growth restriction [5, 29, 30].

The aim of this study was to evaluate the maternal and neonatal characteristics of pregnant women infected by COVID-19 disease and assessing the maternal and neonatal outcomes in Iraqi pregnant women.

Patients and Methods

The design of current study was a clinical prospective follow up study carried out in Obstetrics care unit of Al-Jamiaa health care center of Al-Adil Health sector of Al-Karkh Health Directorate in Baghdad city-Iraq. The duration of the study was

six months through the period from 1st of July to end of December, 2020.

The study population was all pregnant women presented to Obstetrics care unit for antenatal care. Adult age (age ≥18 years), pregnancy, at gestational age of 28 weeks and more presented for antenatal care services were the inclusion criteria.

The exclusion criteria were younger age pregnant women, second trimester, history of confirmed COVID-19 infection in last 6 months, co-morbidity with medical diseases (such as diabetes mellitus, hypertension and cardiovascular disease), history of obstetrical diseases (such as preeclampsia, recurrent miscarriages and antepartum hemorrhage), intrauterine growth retardation, congenital anomalies and women refused to participate.

The ethical considerations were implemented according Helsinki Declaration regarding ethical approval of Health authorities, (ethical approval was taken from Ethical Committee at Iraqi Ministry of Health), informed oral consent of pregnant women and confidentiality of data in addition to continuous management and care for infected pregnant women. A convenient sample of 132 pregnant women at labour was selected after eligibility to inclusion and exclusion criteria.

The data were collected by the researcher from selected pregnant women directly and fulfilling a prepared questionnaire. The pregnant women enrolled in the study were tested by COVID-19-Reverse transcription *polymerase chain reaction* (RT-PCR) test at their presentation to Obstetric care unit. Each pregnant women included in this study was examined by the researcher after taking full history and some of them referred to Radiology for chest x-ray to assess extent of lung involvement. The confirmation of COVID-19 diagnosis was done according to the Iraqi guidelines assessed by Iraqi Ministry of Health. The treatment protocol of patients was designed according to

Iraqi Guidelines in management. The patients were followed up from their presentation until referral to hospital, delivery and discharge through phone calling. The improvement was reported according to the patient's condition and laboratory findings.

Deteriorated or not improved COVID-19 cases are characterized by severe symptoms of acute respiratory distress syndrome, low oxygenation, neutophilia and lymphopenia, very high CRP, elevated D-dimer and sometimes on extent of lung involvement by x-ray. Death or alive final outcome was finally reported. The neonates were admitted to neonatal intensive care unit after labour and also examined by RT-PCR test for infection by COVID-19 and assessed by Pediatrician.

The data collected were analyzed statistically by Statistical Package of Social Sciences software version 22. The Chi square and Fischer's exact tests were applied for analyzing the data as suitable. Level of significance (p value) was regarded statistically significant if it was 0.05 or less.

Results

This study included 132 pregnant women with mean age of (24.6 years) and range of 20-43 years; 72% of pregnant women were in age group 20-29 years, 25% of pregnant women were in age group 30-39 years and 3% of pregnant women were in age group of 40 years and more. Primigravidity was represented by 17.4% of pregnant women, while multigravidity was represented by 82.6% of them. (***Table 1***)

Table 1: General characteristics of pregnant women.

Variable	**No.**	**%**
Age mean±SD (24.6±5.6 years)		
20-29 years	95	72.0
30-39 years	33	25.0
≥40 years	4	3.0
Gravidity		
Primigravida	23	17.4
Multigravida	109	82.6
Total	**132**	**100.0**

Delivery mode of studied pregnant women was normal vaginal delivery for 54.5% of pregnant women and cesarean section for 45.5% of pregnant women. The cesarean section was the first for 46.7% of pregnant women, or 2nd-4th for 35% of pregnant women or 5th and more 18.3% of pregnant women delivered by cesarean section. The death was recorded only for one pregnant woman, while 99.2% of pregnant women were alive. (***Table 2***)

Table 2: Maternal outcomes of pregnant women.

Variable	**No.**	**%**
Delivery mode		
Normal vaginal	72	54.5
Cesarean section	60	45.5
Cesarean section number		
First	28	46.7
2nd-4th	21	35.0
5th and more	11	18.3
Maternal status		
Alive	131	99.2
Dead	1	0.8
Total	**100**	**100.0**

The gestational age of fetuses was preterm among 17.4% of pregnant women, while term gestational age was recorded for 82.6% of pregnant women. Fetal death was detected among 5 (3.8%) fetuses, while alive fetal status was detected among 96.2% of pregnant women. Male fetuses represented 40.2%, while female fetuses represented 59.8% of them. The fetal intrauterine death was shown in 2.3% of pregnant women, while meconium aspiration was shown in 13.6% of pregnant women fetuses. (***Table 3***)

Table 3: Fetal outcomes of pregnant women.

Variable	No.	%
Gestational age		
Preterm	23	17.4
Term	109	82.6
Fetal status		
Alive	127	96.2
Dead	5	3.8
Fetal gender		
Male	53	40.2
Female	79	59.8
Intrauterine death		
Yes	3	2.3
No	129	97.7
Meconium aspiration		
Yes	18	13.6
No	114	86.4
Total	**132**	**100.0**

The maternal COVID-19 PCR test showed that 63.6% of pregnant women at labour room had positive COVID-19 infection, while 36.4% of them were free from COVID-19 infection. The fetal COVID-19 PCR test showed that only 6 (4.5%) fetuses had positive COVID-19 infection after delivery, while 95.5% of fetuses had no COVID-19 infection after delivery. (***Table 4***)

Table 4: Maternal and fetal COVID-19 PCR tests findings.

Variable	No.	%
Maternal COVID-19 PCR		
Positive	84	63.6
Negative	48	36.4
Fetal COVID-19 PCR		
Positive	6	4.5
Negative	126	95.5
Total	**132**	**100.0**

No significant differences were observed between pregnant women with positive COVID-19 infection and pregnant women with negative COVID-19 infection regarding age of women (p=0.1) and gravidity history (p=0.2). (***Table 5***)

Table 5: Distribution of pregnant women general characteristics according to maternal COVID-19 PCR test findings.

Variable	**Maternal COVID-19 PCR**				**P**
	Positive		**Negative**		
	No.	**%**	**No.**	**%**	
Age					0.1 NS
20-29 years	62	73.8	33	68.8	
30-39 years	18	21.4	15	31.3	
≥40 years	4	4.8	0	-	
Gravidity					0.2 NS
Primigravida	17	20.2	6	12.5	
Multigravida	67	79.8	42	87.5	

S=Significant, NS=Not significant.

No significant differences were observed between pregnant women with positive COVID-19 infection and pregnant women with negative COVID-19 infection regarding delivery mode (p=0.1) and maternal status (p=0.2). There was a highly significant association between first cesarean section of pregnant women and positive COVID-19 infection (p<0.001). (***Table 6***)

Table 6: Distribution of maternal outcomes according to maternal COVID-19 PCR test findings.

Variable	**Maternal COVID-19 PCR**				**P**
	Positive		**Negative**		
	No.	**%**	**No.**	**%**	
Delivery mode					0.1 NS
Normal vaginal	42	50.0	30	62.5	
Cesarean section	42	50.0	18	37.5	
Cesarean section number					**<0.001** S
First	28	66.7	0	-	

2nd-4th	12	28.6	9	50.0	
5th and more	2	4.7	9	50.0	
Maternal status					0.4 NS
Alive	83	98.8	48	100.0	
Dead	1	1.2	0	-	

S=Significant, NS=Not significant.

A significant association was observed between preterm labour of fetuses and positive maternal COVID-19 infection (p=0.01). No significant differences were observed between pregnant women with positive COVID-19 infection and pregnant women with negative COVID-19 infection regarding fetal status (p=0.08), although 5 fetuses of pregnant women with positive COVID-19 infection were died, while no death reported among fetuses of women with negative COVID-19 infection. No significant differences were also observed between pregnant women with positive COVID-19 infection and pregnant women with negative COVID-19 infection (p=0.1) and intrauterine death (p=0.1). There was a significant association between meconium aspiration of fetuses and positive maternal COVID-19 infection (p=0.001). (***Table 7***)

Table 7: Distribution of fetal outcomes according to maternal COVID-19 PCR test findings.

Variable	**Maternal COVID-19 PCR**				**P**
	Positive		**Negative**		
	No.	**%**	**No.**	**%**	
Gestational age					**0.01** S
Preterm	20	23.8	3	6.3	
Term	64	76.2	45	93.8	
Fetal status					0.08 NS
Alive	79	94.0	48	100.0	
Dead	5	6.0	0	-	

Fetal gender					0.1 NS
Male	38	45.2	15	31.3	
Female	46	54.8	33	68.8	
Intrauterine death					0.1 NS
Yes	3	3.6	0	-	
No	81	96.4	48	100.0	
Meconium aspiration					**0.001** S
Yes	18	21.4	0	-	
No	66	78.6	48	100.0	

S=Significant, NS=Not significant.

Discussion

The COVID-19 disease in pregnancy represents a great challenge to obstetricians as the pregnant women are more prone for infection and risk of vertical transmission to fetuses leading to adverse outcomes for both mother and neonates in addition to risk of COVID-19 disease progression to severe acute respiratory disease which facing the challenge of mechanical ventilation of pregnant women [31].

Current study showed that that 63.6% of pregnant women at labour room had positive COVID-19 infection and only 6 (4.5%) fetuses for positive COVID-19 women had positive COVID-19 infection. These rates are higher than results of Woods et al [32] in USA on tested 415 pregnant women and tested 71 fetuses in urban hospital which revealed that 9.9% of pregnant women by PCR had positive COVID-19 infection and 2.8% of fetuses had positive COVID-19 infection. Our study rates are also higher than results of Knight et al [26] prospective national population based study in UK on 427 pregnant women admitted to hospital which found that incidence rate of positive COVID-19 among pregnant women was (4.9 per 1000 women) and incidence of COVID-19 disease among infants was (5%). These differences might be attributed to many reasons such as differences in health infrastructure and epidemiology of COVID-19 disease between different countries in

addition to differences in study design and sample size between literatures and fact that our study center is tertiary center receiving referrals of difficult obstetrical cases from different obstetrical centers.

In present study, no significant differences were observed between infected pregnant women and non-infected pregnant women regarding age of women and gravidity history. These findings are inconsistent with results of Zambrano et al [33] study in USA and Du et al [34] study in China which documented that maternal age of more than 35 years and gravidity history play role in COVID-19 infection and severity among pregnant women.

Present study showed a highly significant association between first cesarean section of pregnant women and positive COVID-19 infection ($p<0.001$). This finding coincides with results of Brandt et al d9 study in USA and Ashokka et al [35] study in Chile which reported higher rates of cesarean section delivery among pregnant women especially first cesarean section. Cai et al [36] stated that it is wrong to adopt the cesarean section as routine delivery mode for pregnant women infected by COVID-19 disease and they proved that maternal and neonatal outcomes of pregnant women delivered by normal vaginal delivery were lower than that of infected pregnant women delivered by cesarean section. Our study showed no significant differences were observed between infected pregnant women and non-infected pregnant women regarding delivery mode. This finding is inconsistent with results of Pirjani et al [37] study in Iran which reported to higher rates of cesarean sections among pregnant women with positive COVID-19 infection. Only one studied infected pregnant woman in present study (1.2%) was died. This finding is lower than results of Sharief et al [38] study in Iraq which documented death of 7 (5.18%) pregnant women after infecting by COVID-19 disease. This difference may be due better obstetrical and medical resuscitation facilities in our tertiary center. However our study

maternal mortality rate is close to results of Karimi et al [39] study in Iran which reported maternal mortality rate of (1.3%) of infected pregnant women with COVID-19.

In current study, a significant association was observed between preterm labour of fetuses and positive maternal COVID-19 infection (p=0.01). This finding is similar to results of many literatures such as Al-Kuraishy et al [40] study in Iraq, Akthar et al [41] study in UK and Yang et al [42] study in USA which found higher risk of preterm birth for infants of infected pregnant women by COVID-19 disease. It was shown that SARS and MERS infections are also regarded as risk factors for preterm birth and other adverse outcomes [29]. The preterm birth might be due to placental disruption caused by COVID-19 infection and the hypoxia resulted from the infection[17]. Also a significant association between meconium aspiration of fetuses and positive maternal COVID-19 infection (p=0.001). This finding coincides with reports of AbdelMassih et al [43] systematic review study in Egypt which stated that infants born for infected pregnant women by COVID-19 disease are at high risk of meconium aspiration. Higher rates of neonatal meconium aspiration might be related to higher rates of first cesarean section among infected pregnant women [44]. Our study showed that 5 (6%) fetuses of pregnant women with positive COVID-19 infection were died, while three intrauterine fetuses death (3.6%) was recorded. These rates are higher than results of Simsek et al [45] study in Turkey which revealed neonatal mortality rate of (1.2%) for infected pregnant women with COVID-19 disease.

In conclusion, the incidence of maternal and fetal COVID-19 infection among sample of Iraqi pregnant women presented to primary health care center for antenatal care is high. The main adverse maternal outcome of infected pregnant women is first cesarean section with relatively acceptable

maternal and fetal mortality rates. The common adverse fetal outcomes for infected pregnant women are preterm labour and meconium aspiration. This study recommended social distancing for pregnant women with precautions and preventive measures that should be undertaken by pregnant women and more efforts from health institutes to encourage regular antenatal care.

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Conflict of interest

Declared none.

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